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ABSTRACT

Sarah Screech, Danny Decibel, Sweetie Sound and Neil Noisy describe their experiences in the world of sound and noise to elementary students. Presented are their reports, games and charts which address sound measurement, the effects of noise on people, methods of noise control, and related areas. The workbook is intended to stimulate students' interest in and awareness of noise and noise pollution control. (Author/WB)

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A NOISE WORKBOOK

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Sounds Alive

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A Noise Workbook

Prepared

by

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for

U.S. Environmental Protection Agency
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Washington, D.C. 20460

December 1979

Quiet Weekend

INTRODUCTION

Sweetie Sound Neil Noisy Sarah Screech Danny Decibel

Our hearing is one of our most important links with our world. Everyday we have many reasons to listen — for time to wake up, for our teacher's instructions, our friend's reports of fun experiences, fire alarms at school, and the choices of ice cream at the store. Listening is a fun part of life.

This "playbook" is a story of four very good friends and their experiences in the world of sound and noise. You will have lots of chances to help them make decisions about their hearing and to help them select good sounds from unwanted sounds everyday.

Our friends, Sweetie Sound, Neil Noisy, Danny Decibel, and Sarah Screech met at school. They are in Ms. Hush's third grade class. These four friends live in a very special community, Allentown, U.S.A. Allentown is the first "Quiet Community" in the United States. This means that the town officials, in cooperation with the U.S. Environmental Protection Agency, have developed a special plan to protect the residents from noises which interfere with talking, working, and relaxing.

To decide what noises were really annoying to people living in Allentown, many persons of all ages were asked questions about noise in the community. Sweetie Sound's grandmother was one of the persons who asked the questions. She told Sweetie that many people disliked noise from traffic, construction, loud parties, barking dogs, honking horns, home appliances like garbage disposals, electric blenders, etc., and outdoor tools like lawn mowers and power saws. Sweetie's grandmother also found that many factors affect how people react to noise.

Last week, the four friends had a wonderful time because their community held a "Quiet Weekend." It was very exciting! Thousands of families packed picnic lunches and arrived at the great big park to enjoy fun, quiet activities. There were games like frisbee contests, music, displays, and lots of family fun. There were also many opportunities to learn about ways to control "too much noise." Unfortunately, Ms. Hush, the friend's teacher, could not attend Quiet Weekend, so she asked the children in her class to prepare reports to help her understand all they had learned about noise pollution.

The children were very excited about this project and worked very hard to make their reports interesting. They even made posters, charts, and created games to play. In the next part of this workbook, you will find the materials they prepared for Ms. Hush. Reading the reports and participating in the games will give you a chance to learn all about noise and how you can help quiet your community.

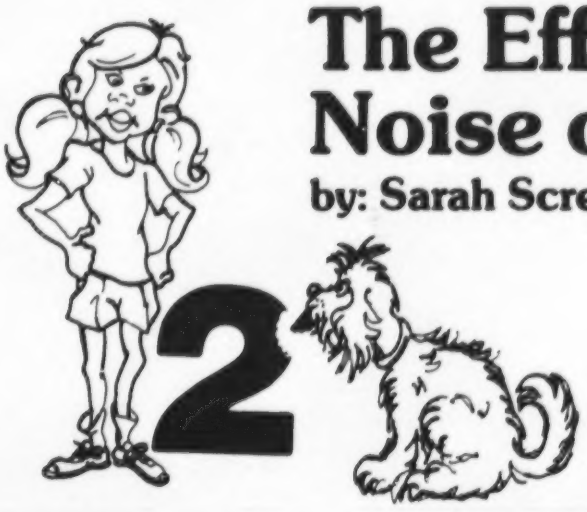
What is Noise?

by: Sweetie Sound

My ears are very special to me. Each day I wake up to chirping birds on my window sill, the sound of Mommie frying bacon, and Daddy listening to the news on the radio. I am so happy that I can hear even tiny little sounds and I want to be able to hear always. Noise is any unwanted sound. Noise causes all sorts of problems for both children and grown-ups. A noise can interfere with our being able to hear wanted sound, disrupt our sleep, make us cross, and even harm our hearing. The other day my Mommie became upset when I couldn't hear her calling me because our neighbor was mowing his lawn. Mommie had had a very long day and was tired of all the noises that had interfered with her day. First she had been awakened by the clanking and banging of the garbage truck. Then the workmen began repairing our street using jackhammers and other noisy equipment. When they finished, the treeman came with his big loud power saw to cut down the tree in our back yard.

When I got home from school with several of my friends, Mommie said she had a headache from listening to all that noise. She told us about her day and asked us to please play quietly. We went to my room and drew lots of pictures of noisemakers in our community, school, and homes. You can do that too — just turn the page. If you don't like to draw, you can make lists instead.

VROOMMM



The Effects of Noise on People

by: Sarah Screech

At Quiet Weekend, I saw a slide show that explained how noise affects us. I had never realized how many problems noise can cause. I really didn't know that too much noise can cause me to lose my hearing.

On one of the slides there was a picture of a very tired man who had been kept awake by a noisy party. He looked very crabby. Good sleep is important to good health. Noise can interfere by waking us up or not letting us sleep well.

There was another slide of a teacher shouting to her students because an airplane was flying over the school. The noise interfered and distracted the students. It takes longer to learn when the teacher is always interrupted. The noise interruptions also annoy the teacher and make her feel tense.

Loud noises cause all sorts of temporary changes inside our bodies. The reason is that noise causes stress and our bodies react to stress. That's why people sometimes get headaches when they are around too much noise.

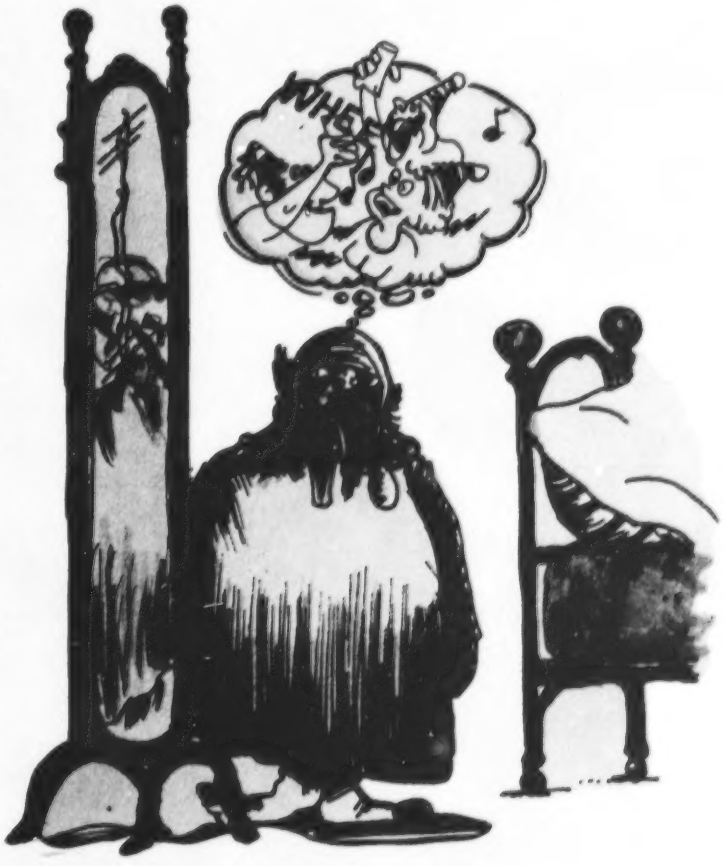
On the final slide, there were some warning signs of when you may have been exposed to too much noise. I wrote them down so I could remember them. These warning signs are:

— Problems understanding or hearing what someone says to you;

— Trouble with hearing after listening to loud music, going to a car race, or being around other loud sounds;

— Ringing or buzzing in your ears after being in a noisy place.

If you have any of these problems, you should try to go to a quieter place. If you can't leave, then

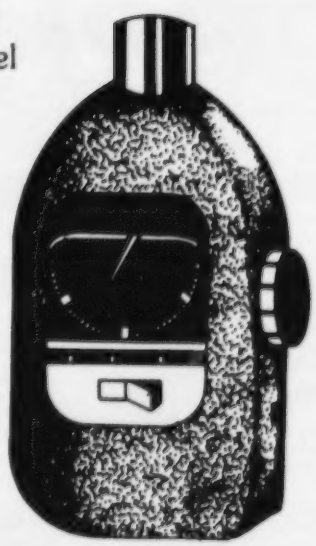


you should wear something over your ears, called ear protectors. These are special earplugs and ear muffs which have been made to help protect our ears from loud sounds. If you continue having problems with your ears for any length of time, be sure to tell your parents so they can arrange for a hearing test for you.

I'm going to protect myself from too much noise; why don't you do it too? If we do, we'll always be able to enjoy the many nice sounds of life.

How Sound is Measured

by: Sarah Screech



I had fun at the Quiet Weekend. One of the things I liked most was learning about how sound is measured. A sound level meter is the instrument used to measure sound. Some simple sound level meters are about the size of a camera. Others are as large as a TV set. The sound level meter has a microphone which "listens" to the sound in a way similar to our ear. It then shows how loud the sound is on a meter which looks something like the dial on most bathroom scales. The bathroom scale shows us how much we weigh in pounds. On the sound level meter, the unit of measurement is the decibel (dB). The louder the sound, the greater the number of decibels. For example, if we whisper, it's about 30 decibels. When we talk, it's about 60 decibels; when we shout, it's about 80 decibels.

During Quiet Weekend, I had a chance to use the sound level meter. It was interesting to make a guess on how loud a sound was and then to measure it to see how close I was.

SARAH'S CHART	Sound Level (decibels)
Item	
Jet Take off (100 ft)	120
Rock Band (3 ft)	110
Chainsaw (3 ft)	100
Busy Street Corner (3 ft)	90
Alarm Clock (3 ft)	80
Vacuum Cleaner (3 ft)	70
Speech (3 ft)	60
Rainfall	50
Bedroom	40
Whisper	30
Empty Concert Hall	20
Rustling Leaves	10

Here's The Chart I Made For You To Use.

Did you read my sound chart on this page? On the next page I made a chart for you to use to measure sounds at school. If your school has a sound level meter, you can make measurements. If not, think about the sounds you hear at school, at home, or on the street. Write them down on your chart, placing the noisiest one at the top. You can also guess or measure how far you were from the source of the sound. Does the distance make a difference?

SOUND CHART

Sounds Heard	Distance from Noise Source	Sound Level (dB)
truck on street	5 ft	very loud (100)
truck on street	50 ft (inside house)	faint rumbling (65)

Your Name _____

4 How We Hear

by: Danny Decibel

During Quiet Weekend, they had a special booth for hearing tests. I put on earphones and listened to tones like musical notes. Each time I heard the tiny sound, even though it was very faint, I raised my hand. I found that I have good hearing in both ears. My Mommie and Daddy were very pleased.

The person who tested my hearing was an audiologist. She explained to Mommie, Daddy, and me all about how we hear. She explained to me that the ear has three parts: an outer ear, a middle ear, and an inner ear. Whenever a sound occurs, sound waves first enter the outer ear and then travel through a tube called the ear canal to a membrane stretched across the canal called the eardrum. The sound waves cause the eardrum to move. The eardrum's movements then cause three tiny bones in the middle ear to move. These bones are called the malleus (hammer), incus (anvil), and the stapes (stirrup). Together, they are called the ossicles. The movement of the ossicles transmits the sound wave message to the inner ear. There the cochlea (which looks like a snail's shell) changes the sound into an electrical message for the hearing nerve which serves as the roadway to carry the message on to the brain.

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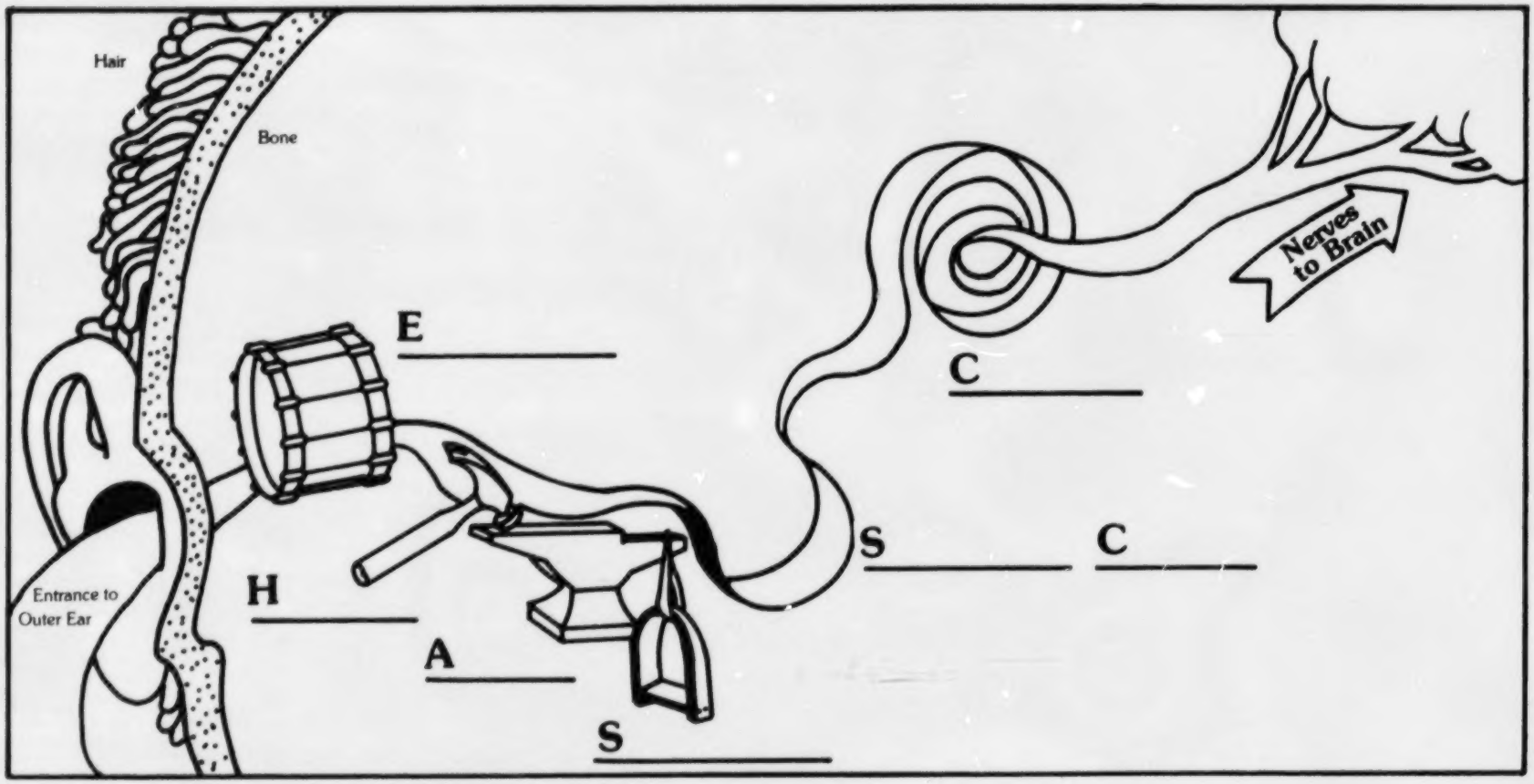


Here's the drawing I made of the ear. See if you can follow the path of the sound waves and fill in the names of the different parts along the way.

hammer **cochlea**

anvil **eardrum**

stirrup **semicircular canals**

Hearing Problems

by: Sweetie Sound

During the winter, I had a very bad earache and I was having trouble hearing my teacher. My Mommie called my doctor and he told us to have my ear examined by a special doctor. This doctor is an expert on ears. He is called an otologist. While I was in his office, he told me all about hearing problems.

There are two main types of hearing loss. One is called a conductive hearing loss; the other is called a sensori-neural hearing loss. A conductive hearing loss is a problem involving your outer or middle ear. It can be caused by too much wax or an infection. Often people who have had bad colds or problems with their tonsils have conductive hearing losses. Luckily, the doctor can usually solve the problem. That's what happened to me! By the time I finished the medicine, my hearing had returned to normal. I was very happy to be able to hear well again.

People who have sensori-neural hearing losses are not as lucky. A sensori-neural hearing loss is caused by a damage to the inner ear. This damage is permanent. Medicine or surgery cannot repair the damage. Sometimes a hearing aid can help by making sound louder, however, it is not the same as having normal hearing.

The otologist told me that there are many possible causes of sensori-neural hearing loss. Some people are born with this kind of hearing loss. Other causes are illnesses, a blow to the head, old age, and noise. My uncle has a sensori-neural hearing loss and wears a hearing aid. His loss was caused by exposure to too much noise during the war. When I talk to him, I always remember to look at him. Seeing my lips move helps him to understand me.

He often reminds me to "protect my hearing". He says birthday parties are not as much fun when you have a hearing problem. You miss a lot of what is being said. I'm always going to protect my hearing because I don't want to miss anything!

The National Noise Problem

by: Danny Decibel

There was a poster at Quiet Weekend that said, "Forty million Americans are working, playing, and living around dangerously loud environmental noise." That's a lot of people and a lot of noise. I suppose that is why Congress set up a special office in the Environmental Protection Agency (EPA) to work on noise control. There are many experts there trying to find ways to reduce noise. They are concerned about protecting our health and welfare. Other Federal, State and local agencies are also helping them.

EPA has identified numerous major noise makers, such as trucks, buses, and jackhammers. Now, they are making rules to help reduce the noise these sources make. They are also helping State and local governments develop plans to control noise. EPA conducts research on the effects of noise and prepares booklets, films, and other materials to help us understand about noise pollution.

I saw one of the movies during Quiet Weekend. It showed that long ago our country was much quieter. However, noise seems to have become an unwanted by-product of our country's progress. Today people live closer together. In cities, most homes have small lots and many people live in apartment buildings. They travel more and use noisy machines, appliances, and tools all the time. Many of the things that help save time also contribute to a noisier world. Life would certainly be complicated without all these noisy helpers, so the answer is to make quieter products. Many manufacturers are working to do exactly that. In fact, before too long, we may see noise labels on certain products in the store. These labels will help us "buy quiet."

Are you shopping for quiet?
Try these quiet products:

ACME Sanders
ACE Lawnmowers
Clark Blenders
Fino Power Saws
White Disposals
Hill Vacuum Cleaners

BUZZZZZ
ROAR
KLINK.
CLANG
KLINK
VROOM
SHOUT

Ways to Control Noise

by: Neil Noisy

My mom said I was the perfect person to write about controlling noise. You see, I sometimes live up to my name by being very noisy. I play with loud toys, slam doors, and shout a lot. However, now that I know that the noise I make is not fun for others, I'm going to try very hard to remember to be quieter.

At Quiet Weekend, I learned about ways to control noise in the community, in the workplace, and at home. Many people are involved in working toward a quieter world and I'm going to help.

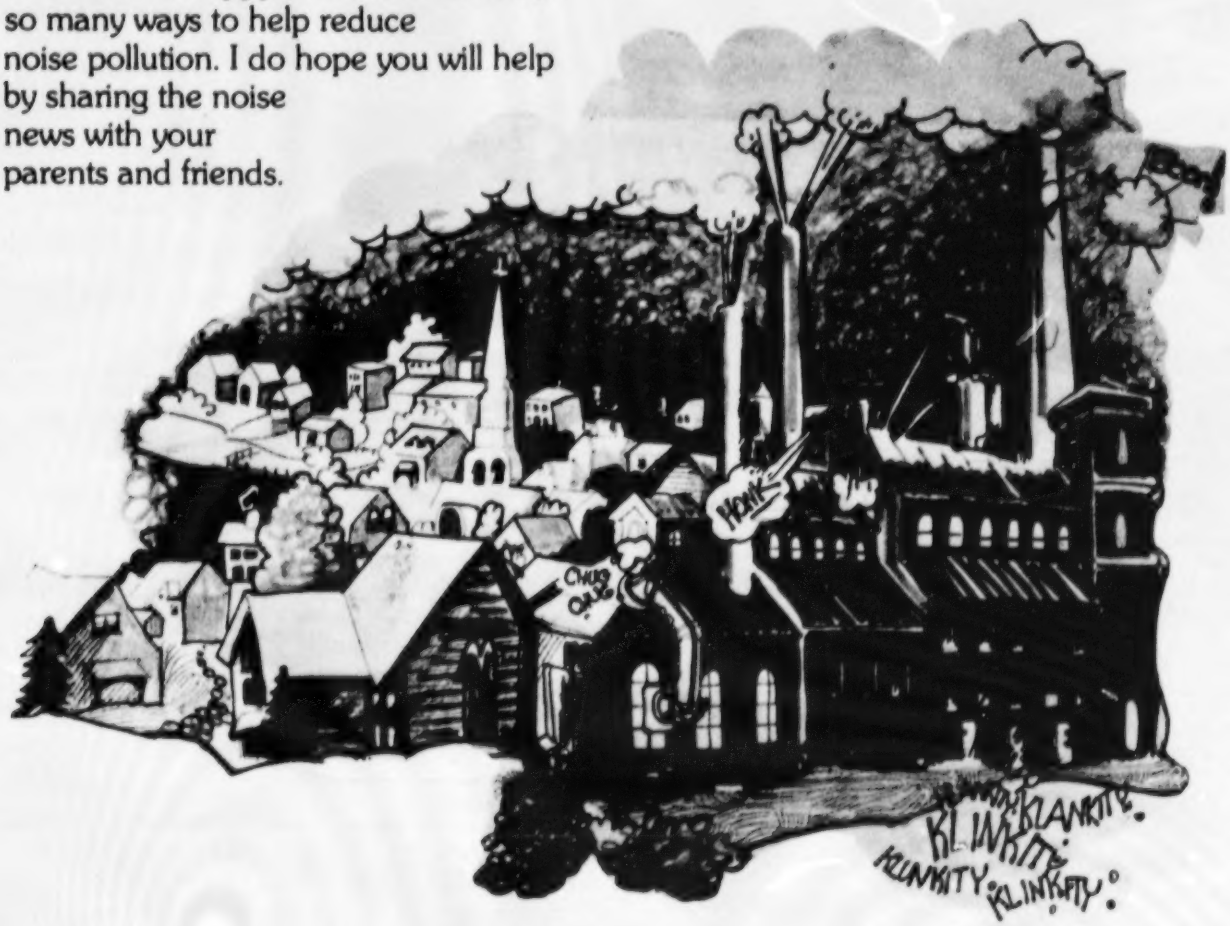
Many communities have set decibel limits which cannot be exceeded by any noise source. If the noise level limit is exceeded, the person responsible must try to reduce the noise. In some communities curfews are set to limit the hours during which noisy equipment can be used. For example, some communities don't allow garbage collection at night in areas where people are sleeping. Other communities are making rules to prevent noisy activities from operating in quiet areas. You can see that it is not a good idea to build a noisy factory next to a school or home. It is also important to build major highways and airports in areas where the noise will not be a problem. Another approach to quieting communities is replacing old, noisy equipment with quieter, new equipment.

My Dad works in a noisy factory and he told me how his company is trying to reduce noise levels. They have identified noisy areas in the plant and have started a

hearing conservation program to protect Dad and his coworkers from too much noise. The program includes working on ways to reduce the noise made by many of the machines and replacing the old machines with quieter ones. Also, there is a schedule to limit the time workers may spend in noisy areas. When in the noisy areas, Dad and his friends wear ear protectors to make the noise seem less loud. Also, the company nurse regularly gives hearing tests to the workers to watch for signs of hearing loss.

At home, Mom, Dad and I have made plans to quiet our environment. In our new recreation room, we are installing carpeting, heavy draperies, and an acoustical tile ceiling. All these things will help to reduce noise. I'm going to help too by remembering not to slam the door or play the television too loud. Also, Daddy fixed our old push lawn mower; he plans to start using it again. It will be quieter, consume less energy, and give Daddy exercise. When we need to replace noisy tools or appliances, we are going to shop for "quieter ones." Mommie says that before too long, noise labels will help us to select quieter products. We will all watch for labels that tell us how much noise various types of equipment make. Then we can select the quieter models.

I am so happy that I have learned so many ways to help reduce noise pollution. I do hope you will help by sharing the noise news with your parents and friends.



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Congratulations on completing the noise workbook! We hope that you have enjoyed learning about sound and noise. You can help us by sharing what you have learned with your parents and friends. Don't forget to tell them all these things:

- It's important to protect your hearing every day.
- Too much noise can cause permanent hearing loss.
- Noise also interferes with conversations, sleep, and sometimes makes us cranky.
- If your parents or friends mention having trouble hearing, remind them to have a hearing test right away.
- If your community is too noisy, find out what local official can help you do something about it. Then tell your parents and friends.
- Remind people who work in noisy places to protect their hearing, but remember that hearing loss is not solely an occupational hazard.
- When your parents are buying new appliances or power tools, remind them to shop for quiet products.
- Whether at home, at school, or while playing, respect the quiet rights of others.
- Lower volume on TV's, stereos, and radios and limit periods of exposure to noise.

REMEMBER! Noise can be controlled. Each person has an important part in controlling noise. We are counting on you, your parents, and your friends to do your share!

If you want to learn more about noise pollution write to:

U.S. Environmental Protection Agency,
Office of Noise Abatement & Control,
Washington, D.C. 20460.

Crossword Puzzle Instructions

Across

1 Unwanted Sound ____ ____ ____ ____ ____.

2 Draperies and carpeting in a room help ____ ____ ____ ____ ____ ____ noise.

3 The unit of sound measurement ____ ____ ____ ____ ____ ____ ____.

4 A sound level meter ____ ____ ____ ____ ____ ____ ____ ____ the decibel level.

5 The higher the number of decibels, the ____ ____ ____ ____ ____ ____ the noise.

Down

A The instrument used to measure noise levels. ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____.

B We hear with our ____ ____ ____ ____.

C It's important to ____ ____ ____ ____ ____ ____ ____ our hearing.

D Exposure to too much noise can damage your ____ ____ ____ ____ ____ ____ ____.

E If you're around a lot of noise, you should ____ ____ ____ ear protectors.

Answers

Across
1. Noise, 2. Reduce, 3. Decibel, 4. Measures, 5. Louder

Down
A. Sound Level Meter, B. Ears, C. Protect, D. Hearing, E. Use

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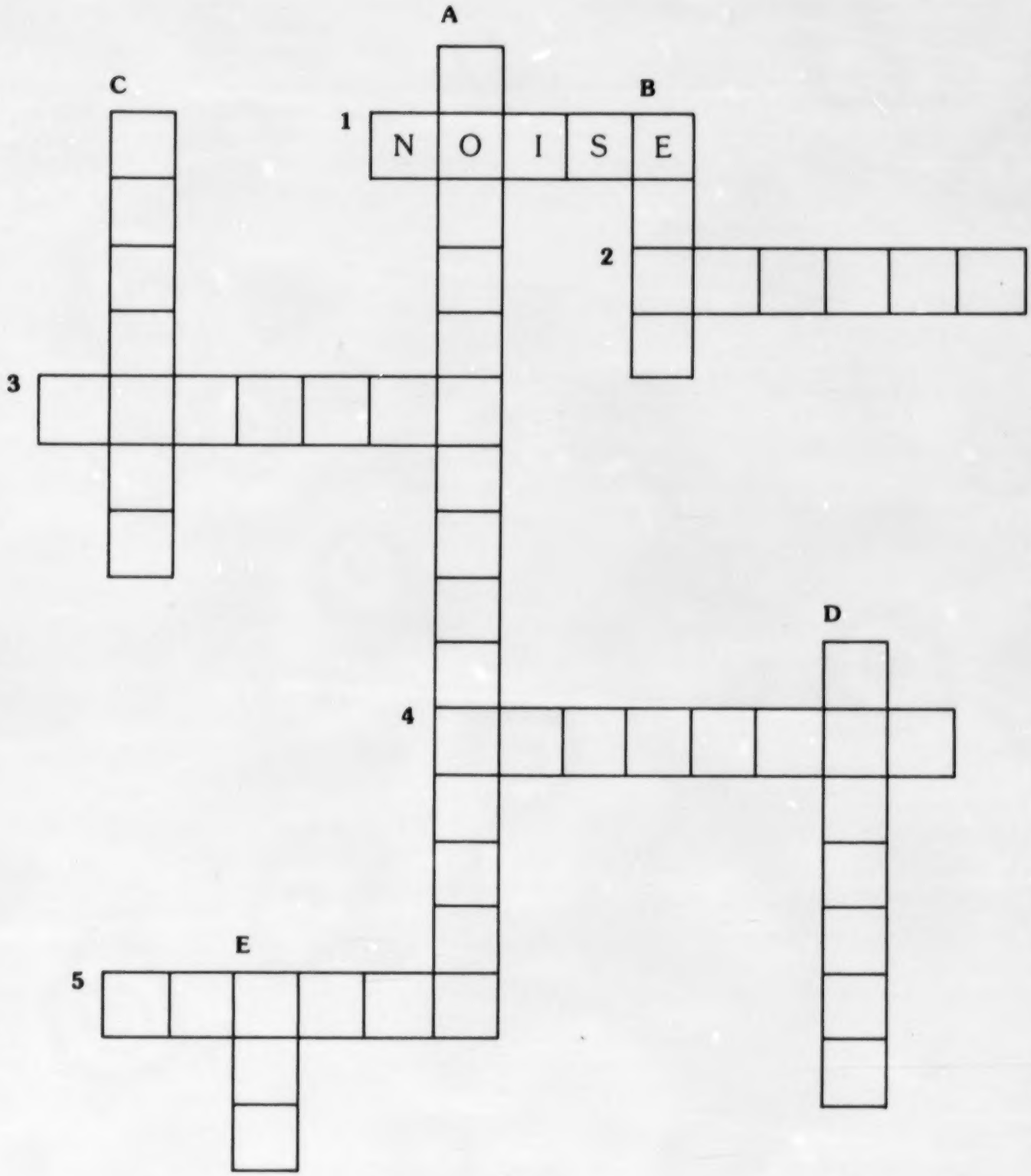
Crossword Puzzle



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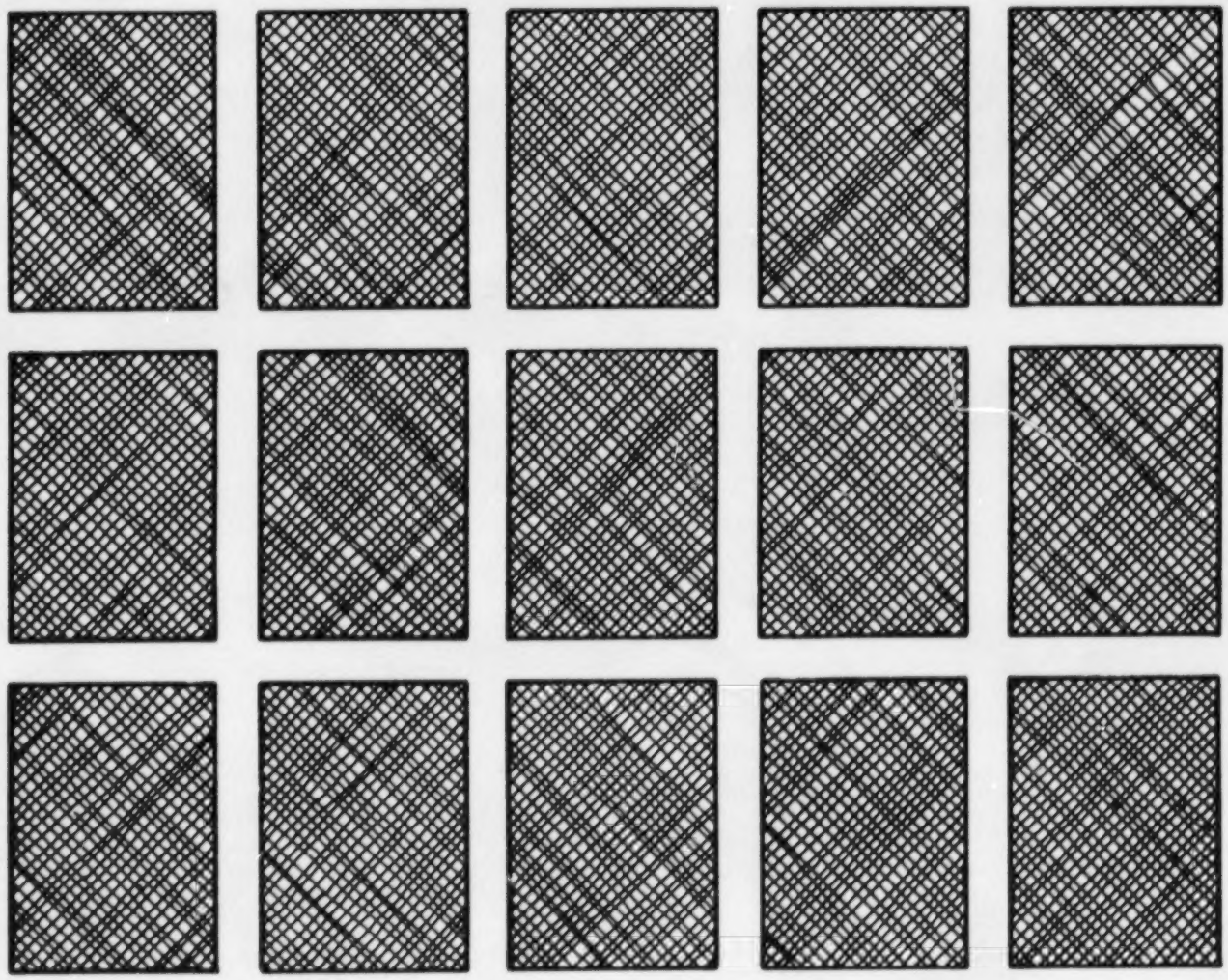
**If you can mark X in all these boxes,
you are a quiet community helper**

My name is: _____

My community is: _____

- ☐ I close doors quietly.
- ☐ I play the television softly and turn it off when I'm not listening.
- ☐ I don't yell when it isn't necessary.
- ☐ When my dog barks, I try to quiet him.
- ☐ I remind my friends not to disturb other people with our noise, when we are playing.
- ☐ I asked Daddy to fix our car so it won't be so noisy.
- ☐ I listen very carefully when I have my hearing tested at school.
- ☐ I know that the loud noises can harm my hearing.

– CUT OUT CARDS –



Matching Card Game Instructions

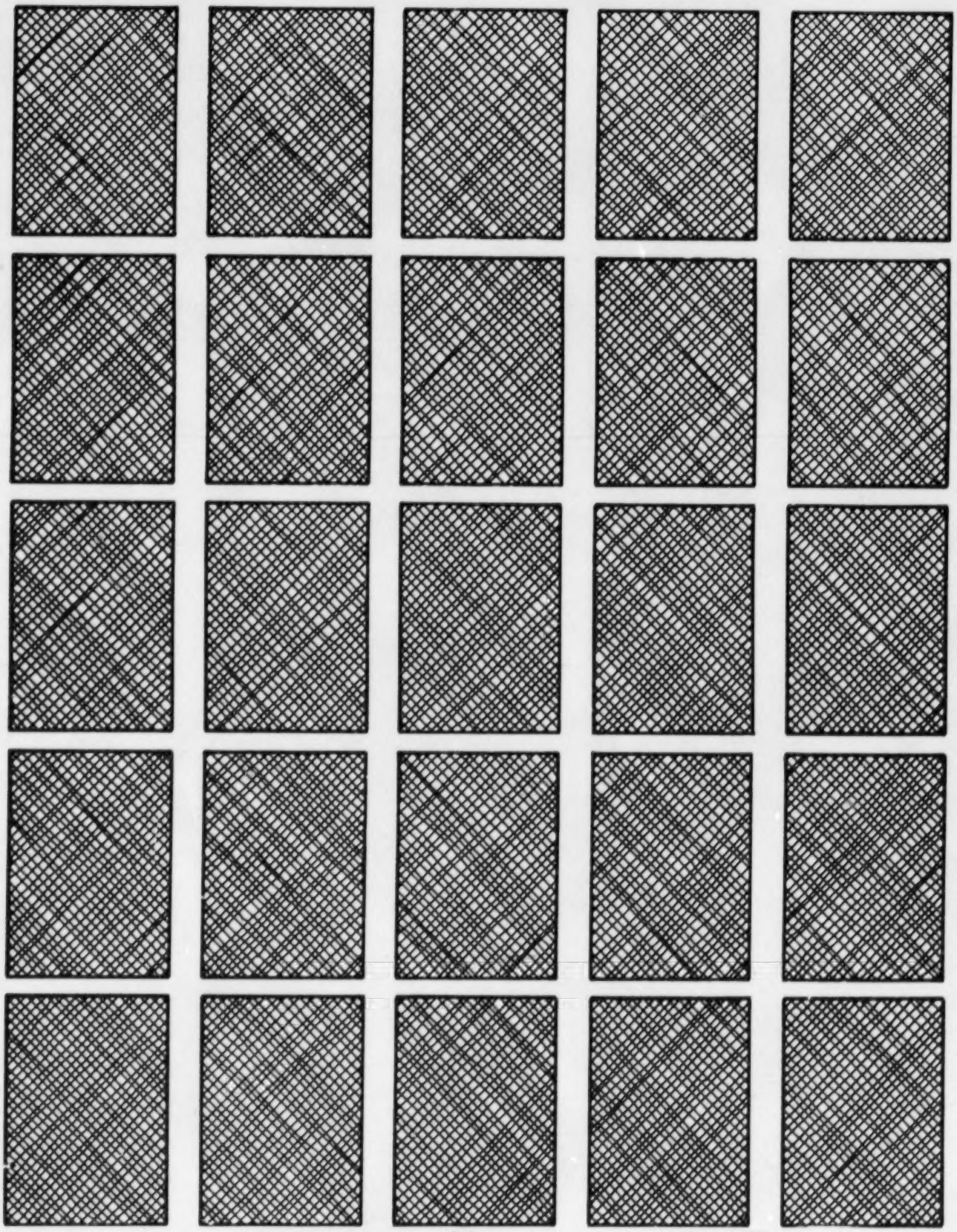
1. Cut out all 40 cards and shuffle.
2. Deal each player 5 cards and place the rest of the cards in the middle of the table.
3. Player #1 asks any other player if he or she has the match to one of his/her cards. If so, Player #1 has another chance to ask for another card. If not, Player #1 draws a card from the deck in the center. Player #2 then takes his turn.
4. The procedure continues until all the cards in the center are used.
5. The player with the most matches wins the game.

– CUT OUT CARDS –

1 **Sound**	**2** **Noise**	**3** **Decibel**	**4** **Sound Level Meter**	**5** **Ossicles**
6 **Auditory Nerve**	**7** **Major Noise Sources**	**8** **Ear Drum**	**9** **Outer Ear**	**10** **Audiolcgist**
11 **Hearing Damage**	**12** **Noise Labels**	**13** **Hearing Protectors**	**14** **Noise Control Methods**	**15** **Ringing in Ears**

– CUT OUT CARDS –

16 dB	17 Hearing Conserva-tion Programs	18 Cap Guns & Firecrackers	19 Health Effects of Noise	20 EPA
1 What We Hear	2 Unwanted Sound	3 Unit of Sound Measure-ment	4 Equipment for Measuring Sound	5 Hammer Anvil Stirrup
6 Carries Sound Message to Brain	7 Airplanes Trucks Building Equipment	8 Separates Outer Ear From Middle Ear	9 Gathers Sound	10 Person Who Tests Hearing
11 Noise is One Cause	12 Help People Select Quiet Products	13 Reduce Noise Exposure	14 Ways to Reduce Noise	15 May Indicate Hearing Loss
16 Abbrevia-tion for Decibel	17 Ways to Protect Hearing	18 Noisy Toys	19 Hearing Loss Annoyance	20 Environ-mental Protection Agency



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THE END

Noise Nopoly Directions

In this game the players are on a noisy trip. They are all anxious to protect their hearing. Won't you join them?

First cut out the players and the numbers.

To play:

1. Cut out numbers, fold and place in a cup.
2. Player #1 shakes cup and draws number. He or she moves the number of squares shown (move backward if minus square is drawn) and returns the number to the cup.
3. Each player takes turn.
4. Any player landing on penalty square, must do as told. This goes for bonus squares too.
5. The first player to complete the trip around the board is the winner.

– CUT OUT PLAYERS AND NUMBER CARDS –

1	2	3	4	5

– 1	– 2	– 3

BIG TRUCK

90 dB

PENALTY

Back 1 Playing TV Too Loud

ROCK MUSIC
110 dB

BONUS
Advance 1 Told Friend Loud Noises Can Harm Hearing

ALARM CLOCK

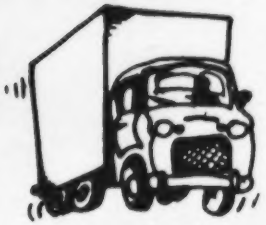
80 dB

LAWN MOWER

90 dB

NORMAL CONVERSATION

60 dB



FIRECRACKER

135 dB

NEW YORK SUBWAY STATION

100 dB

PROTECT YOUR HEARING

JACKHAMMER

90 dB

PENALTY

Back 1 Slamming Door

JET PLANE TAKEOFF

120 dB

WHISPERING

30 dB

MODERATE RAINFALL

50 dB

BUSY CITY INTERSECTION

80 dB

BONUS
Advance 1 For Having Your Hearing Tested

CONSTRUCTION SITE

100 dB

BEDROOM

40 dB

NOISE FACTORY

100 dB

START

33

39